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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 09/882,699      | 06/15/2001  | Xiaoming Ren         | 107044-0009         | 1351             |

24267 7590 11/26/2004  
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EXAMINER  
YUAN, DAH WEI D

ART UNIT PAPER NUMBER  
1745

DATE MAILED: 11/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/882,699

Applicant(s)

REN, XIAOMING

Examiner

Dah-Wei D. Yuan

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 01 October 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-113 is/are pending in the application.
- 4a) Of the above claim(s) 1-23 and 63-113 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 24-62 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 August 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_

**METALIC LAYER COMPONENT FOR USE IN A DIRECT OXIDATION FUEL CELL**

Examiner: Yuan      S.N. 09/882,699      Art Unit: 1745      November 24, 2004

***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on October 1, 2004 has been entered. Claims 24,44 have been amended.

***Claim Rejections - 35 USC § 112***

2. The claim rejections under 35 U.S.C. 112, first paragraph, on claims 24-62 are withdrawn, because the independent claim has been either amended.

***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

4. Claims 24-30,33,37,38,41-51,54-62 are rejected under 35 U.S.C. 102(e) as being anticipated by Cisar et al. (US 6,410,180).

With respect to claims 24, 61, 62, Cisar et al. teach a fuel cell that is suitable for operating with gas fuels or, alternatively, directly with liquid fuels, such as methanol. The direct oxidation fuel cell comprises (a) a protonically conductive, electronically non-conductive membrane (54), (b) an anodic metal diffusion layer (metal grid, 82), (c) an anode catalyst (electrocatalyst, 56), which is disposed between the anode catalyst and the anode face of the membrane and (d) a cathode catalyst, which is disposed between the cathode catalyst and the cathode side of the housing. The metal grids can be selected from a wide variety of material including expanded metal, woven metal wire product and perforated metal sheets. See Column 10, Lines 16-54, Column 12, Lines 39-67; Column 13, Lines 27-42; Figures 6B, 11. The metal grids can be used to regulate the flow of the fuel substance and to conduct the current from one cell to the adjacent cell.

With respect to claims 25, 26, the metal grid (electrically conductive member) may be a sheet of expanded metal mesh or wire. The expanded metal mesh or other electrically conductive member preferably has a great portion of open area than does carbon cloth or paper to increase the gas to and from the catalyst areas.

With respect to claim 27, the metal grid can be an expanded metal, a product fabricated by piercing and stretching a sheet of metal or metallic foil. A wide range of materials can be used including titanium, nickel, copper, stainless steel, aluminum and niobium.

With regard to claim 28, the metal grid can be further gold plated to reduce the contact resistance; i.e., it is inert to the liquid fuel used.

With respect to claims 29 and 33, in addition to expanded metal, perforated metal sheets and woven metal wire products, i.e., pieces of metal bonded together that have spaces therebetween, are suitable to employ as the metal grid as well. Both forms of grids have pores with more than one dimension.

With respect to claims 30 and 37, mixture of Vulcan XC-72R carbon powder, PTFE, water and surfactant are sonicated to reach complete dispersion and the resulting paste is spread onto the expanded foil grid.

With respect to claims 41,42,43, the metal grid is also used as a current collector. Figure 1 show the typical arrangement of a fuel cell in which flow field plates are disposed parallel to the anodic diffusion layer.

With respect to claims 44-51,54-56, due to similarity and mirror image between the anodic diffusion layer and cathode diffusion layer on the cathode side of the protonically conductive electronically non-conductive membrane (see Figure 6A), the aforementioned arguments of the former are applicable to the latter.

With respect to claims 57-60, Cisar et al. teach the best way to lower contact resistance and improve corrosion resistance is to plate the metallic grid with a layer of precious metal, such as gold, platinum, palladium or ruthenium. See Abstract, Column 2, Lines 58-63; Column 9, Lines 38-67; Column 10, Lines 16-60; Column 12, Lines 39-55; Column 13, Lines 1-55; Example 1.

It is noted that claim 38 is a product-by-process claim. "Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the

product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” In re Thorpe, 777 F. 2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). Since Cisar’s bonded metal piece (woven metal wire) is similar to that of the Applicant’s, Applicant’s process is not given patentable weight in this claim.

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 31,32,34-36,39,40,52,53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cisar et al. (US 6,410,180) as applied to claims 24-30,33,37,38,41-51,54-62 above, and further in view of Yu et al. (US 6,399,202).

Cisar et al. teach a direct oxidation fuel cell system as described above in Paragraph 4. However, Cisar et al. do not disclose the metallic diffusion layer is treated with a substance that renders a portion of the layer hydrophilic. Yu et al. disclose a gas-diffusion electrode for use in a fuel cell system. Specifically, Yu et al. teach the fabrication of gas diffusion electrode with a precisely controlled degree of hydrophobic and/or hydrophilic characteristics by using functional

groups. Water-repellent structures of the diffusion layer are generally achieved by coating the surface with a hydrophobic material, such as polytetrafluoroethylene. The most common method to make the diffusion layer partly hydrophilic includes the use of a hydrophilic fluorinated resin, such as NAFION. As a result, the gas diffusion layer, which has attached at least one hydrophilic organic group as well as at least one hydrophobic organic group, can better promote a hydrophobic/hydrophilic balance in the active layer. See Column 1, Lines 66-67; Column 2, Lines 35-41; Column 3, Lines 17-45; Column 6, Lines 32-37. Therefore, it would have been obvious to one of ordinary skill in the art to treat the gas diffusion layers of Cisar et al. with both PTFE and NAFION<sup>®</sup>, because Yu et al. teach the importance of optimum hydrophilic/hydrophobic properties on the gas diffusion layers.

With respect to claims 34,35, Yu et al. teach the gas diffusion layer is attached with at least one hydrophilic organic group and at least one hydrophobic organic group. Yu et al. do not specifically disclose relationship between the pore size of the gas diffusion layer and hydrophilicity (or hydrophobicity). However, it is the position of the examiner that such characteristics are inherent, given that pores of different sizes are distributed randomly on the metallic diffusion layer, therefore, at least some of the large pores would be treated with a hydrophilic material while at least some of the small pores would be treated with a hydrophobic material. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature *is necessarily present in that which is described in the reference*. In re Robertson, 49 USPQ2d 1949 (1999).

***Response to Arguments***

7. Applicant's arguments filed on October 1, 2004 have been fully considered but they are not persuasive.

*Applicant's principle arguments are*

*The instant claim is directed to a metallic diffusion layer that operate to fix the rate of flow of fuel to the anode face of the PCM.*

In response to Applicant's arguments, please consider the following comments.

Cisar et al. teach the metal grid (metallic diffusion layer) is selected from a wide variety of material including expanded metal, woven metal wire product and perforated metal sheets. They all can operate to fix the flow rate of fuel to the anode of the fuel cell through the openings in the metal.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dah-Wei D. Yuan whose telephone number is (571) 272-1295. The examiner can normally be reached on Monday-Friday (8:00-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan, can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications



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may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Dah-Wei D. Yuan  
November 24, 2004

A handwritten signature in black ink, appearing to read "Dah-Wei D. Yuan", with a stylized flourish at the end.